CHI MEI OPTOELECTRONICS CORP.

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Model No.: V216C1-L02
Preliminary

TFT LCD Preliminary Specification

MODEL NO.: V216C1 - L02

LCD TV Head Division	
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REVISION HISTORY

Version	Date	Page (New)	Section	Description
Ver 1.0	Mar. 06,06	All	All	Preliminary Specification was first issued.
Ver 1.0	Mar. 06,06	All	All	RoHS Compliance

1. GENERAL DESCRIPTION

1.1 OVERVIEW

V216C1-L02 is a 21.66" TFT Liquid Crystal Display module with 6-I CCFL Backlight unit and 2Path-RSDS interface. This module supports 1440 x 900 WXGA+ format and displays 262144 colors(6-bit).

1.2 FEATURES

- High brightness (400 nits)
- High contrast ratio (1000:1)
- Fast response time (Gray to Gray average 6.5ms)
- High color saturation (NTSC 75%)
- WXGA+ (1440 x 900 pixels) resolution
- DE (Data Enable) only mode
- 2Path-RSDS interface

1.3 APPLICATION

- TFT LCD TVs, Multi-Function Monitors

1.4 GENERAL SPECIFICATI0NS

Item	Specification	Unit	Note
Active Area	466.56x291.6	mm	(1)
Bezel Opening Area	470.6x295.6	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1440 x R.G.B. x 900	pixel	-
Pixel Pitch(Sub Pixel)	0.324	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	16.2M	color	-
Display Operation Mode	Transmissive mode / Normally black	-	-
Surface Treatment	Hardness : 3H Anti-Glare coating (Haze 25%)	-	-

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	491.0	491.6	492.2	mm	(1)
	Vertical(V)	323.7	324.2	324.7	mm	
	Depth(D)	20.63	21.43	22.23	mm	-
Weight		-	3600	-	gm.	-

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1)
Operating Ambient Temperature	T_{OP}	0	+50	ºC	(1), (2)
Shock (Non-Operating)	S_{NOP}	-	50	G	(3), (5)
Vibration (Non-Operating)	V_{NOP}	-	1.0	G	(4), (5)

Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta ≦ 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

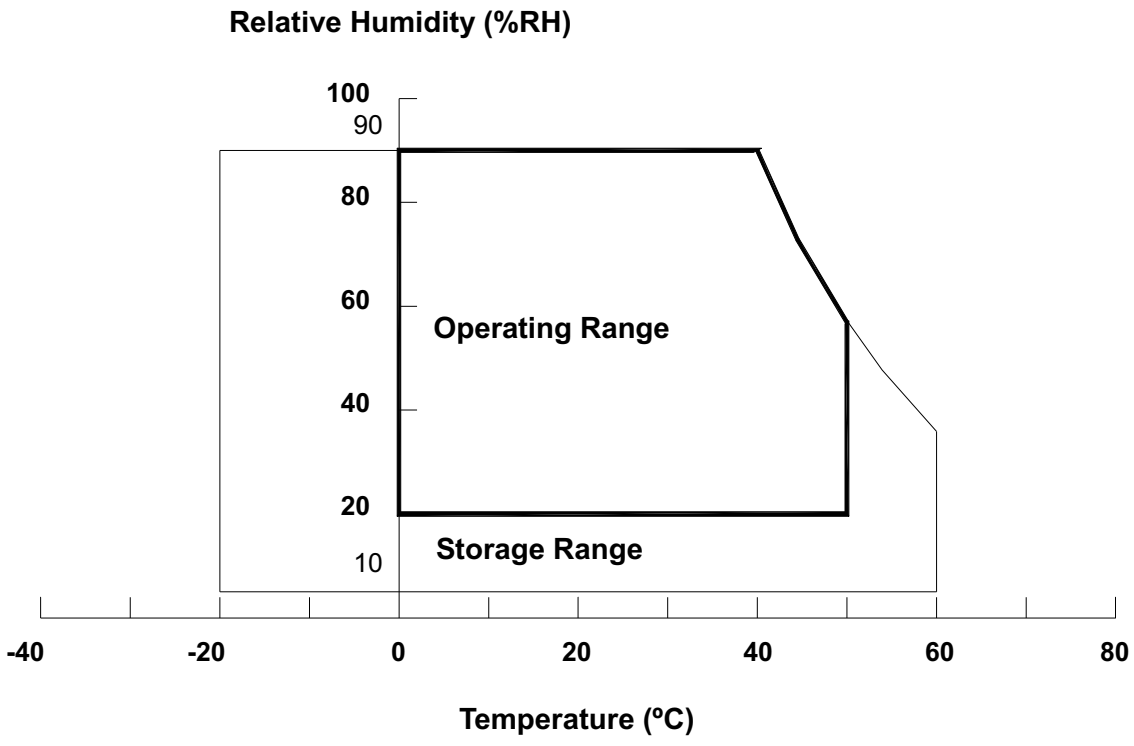
(c) No condensation.

Note (2) The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 60 ºC with LCD module alone in a temperature controlled chamber. Thermal management should be considered in your product design to prevent the surface temperature of display area from being over 60 ºC. The range of operating temperature may degrade in case of improper thermal management in your product design.

Note (3) 11 ms, half sine wave, 1 time for ± X, ± Y, ± Z.

Note (4) 10 ~ 500 Hz, 10 min, 1 time each X, Y, Z.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.



2.2 ELECTRICAL ABSOLUTE RATINGS

2.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	VAA	-0.3	+14.0	V	-
	V33V	-0.3	+5.0	V	
	VGH	-0.3	+30.0	V	
	VGL	-12.0	+0.3	V	

2.2.2 BACKLIGHT UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Lamp Voltage	V_L	-	3000	V_{RMS}	-
Lamp Current	I_L	-	7.5	mA_{RMS}	-
Lamp Frequency	F_L	20	80	KHz	

3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

Ta = 25 ± 2 ºC

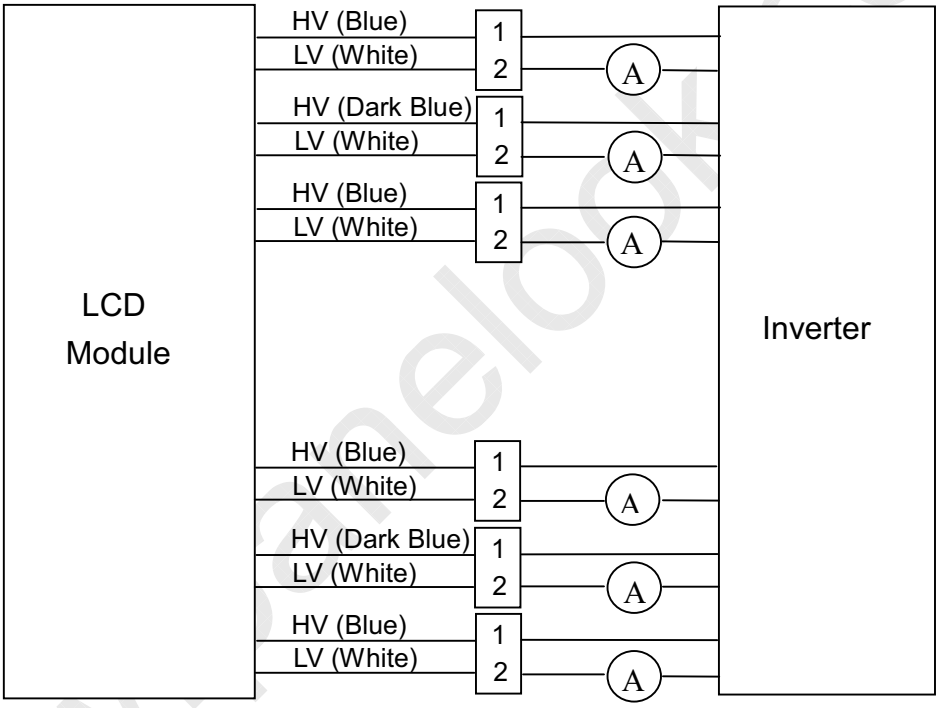
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		VAA	13.2	13.4	13.6	V	
		V33V	3.2	3.3	3.4	V	
		VGH	23.0	23.5	24.0	V	
		VGL	-5.9	-5.6	-5.3	V	
Power Supply Current		IAA	-	-	300	mA	
		I33	-	-	100	mA	
		IGH	-	-	10	mA	
		IGL	-10	-	-	mA	
RSDS Interface	Differential Input High Threshold Voltage	$V_{DIFFRSDS}$	100	200	-	mV	-
	Differential Input Low Threshold Voltage	$V_{DIFFRSDS}$		-200	-100	mV	-
	Common Input Voltage	V_{CMRSDS}	0.1	1.2	2.1	V	-
	Terminating Resistor	R_T	81.18	82	82.82	ohm	-
CMOS interface	Input High Threshold Voltage	V_{IH}	2.7	-	3.3	V	-
	Input Low Threshold Voltage	V_{IL}	0	-	0.7	V	-

3.2 BACKLIGHT UNIT

Ta = 25 ± 2 °C

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Lamp Input Voltage	V_L	-	766	.-	V_{RMS}	I_L = 7.0 mA
Lamp Current	I_L	6.5	7	7.5	mA_{RMS}	-
Lamp Turn On Voltage	V_S		-	1500	V_{RMS}	Ta = 25 °C
			-	1700	V_{RMS}	Ta = 0 °C
Operating Frequency	F_L	40	50	60	KHz	-
Lamp Life Time	L_{BL}	40000	50000	-	Hrs	-

Note (1) Lamp current is measured by utilizing high frequency current meters as shown below:



Note (2) The voltage shown above should be applied to the lamp for more than 1 second after startup. Otherwise the lamp may not be turned on.

Note (3) The lamp frequency may produce interference with horizontal synchronous frequency from the display, and this may cause line flow on the display. In order to avoid interference, the lamp frequency should be detached from the horizontal synchronous frequency and its harmonics as far as possible.

Note (4) The lifetime of a lamp is defined as the time in which it continues to operate under the condition Ta = 25 ±2 °C and I_L = (6.5) ~ (7.5) mArms until one of the following events occurs:

(a) When the brightness becomes equal or less than 50% of its original value.

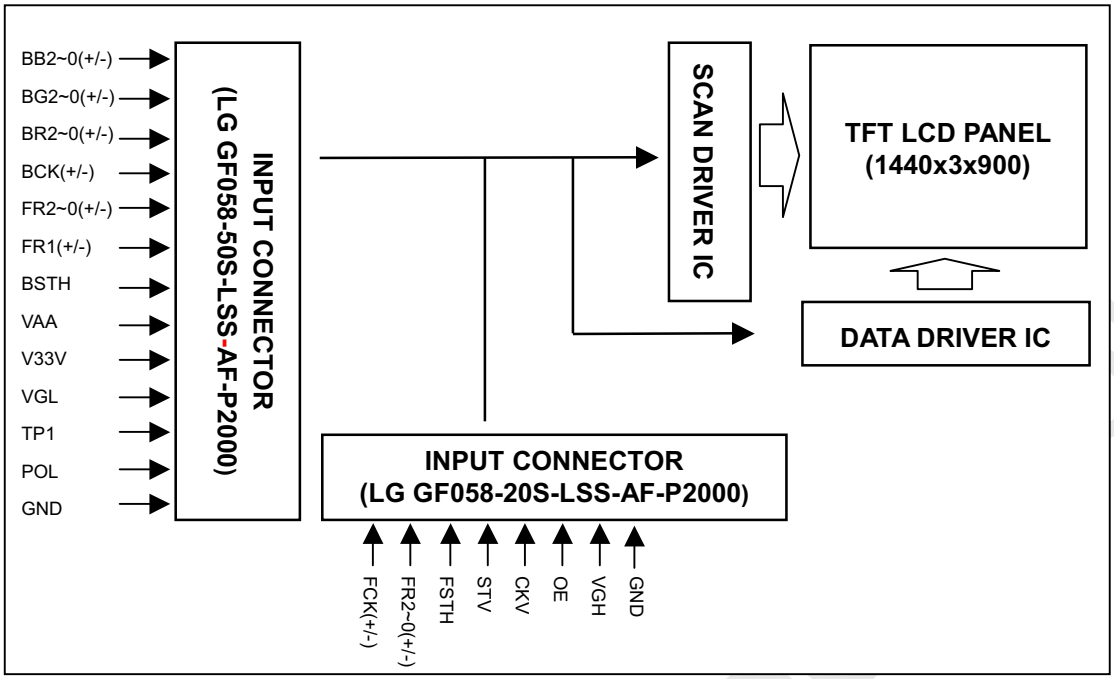
(b) When the effective discharge length becomes equal or less than 80% of its original value. (Effective discharge length is defined as an area that has equal or more than 70% brightness

compared to the brightness at the center point.)

Note (5) The waveform of the voltage output of inverter must be area-symmetric and the design of the inverter must have specifications for the modularized lamp. The performance of the Backlight, such as lifetime or brightness, is greatly influenced by the characteristics of the DC-AC inverter for the lamp. All the parameters of an inverter should be carefully designed to avoid producing too much current leakage from high voltage output of the inverter. When designing or ordering the inverter please make sure that a poor lighting caused by the mismatch of the Backlight and the inverter (miss-lighting, flicker, etc.) never occurs. If the above situation is confirmed, the module should be operated in the same manners when it is installed in your instrument.

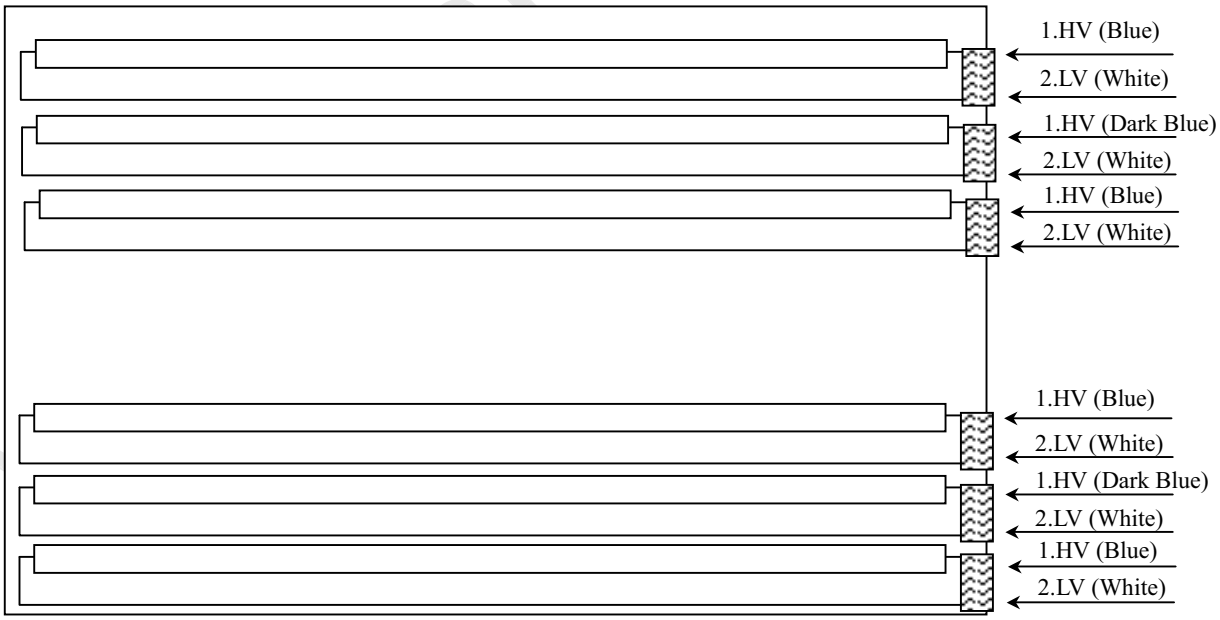
4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



Note (1) Connector Part No.: (L:LG GF058-50S-LSS-AF-P2000)
(R:LG GF058-20S-LSS-AF-P2000)or compatible

4.2 BACKLIGHT UNIT



5. INTERFACE PIN CONNECTION

5.1 TFT LCD MODULE

CN1 Connector Pin Assignment

Pin No.	Symbol	Description	Note
1	GND	Ground	
2	BB2P	Right side RSDS data of Blue pixel 4,5 bits	
3	BB2N		
4	BB1P	Right side RSDS data of Blue pixel 3,2 bits	
5	BB1N		
6	BB0P	Right side RSDS data of Blue pixel 1,0 bits	
7	BB0N		
8	BG2P	Right side RSDS data of Green pixel 4,5 bits	
9	BG2N		
10	BG1P	Right side RSDS data of Green pixel 3,2 bits	
11	BG1N		
12	BG0P	Right side RSDS data of Green pixel 1,0 bits	
13	BG0N		
14	GND	Ground	
15	BCKP	Right side RSDS data clock	
16	BCKN		
17	GND	Ground	
18	BR2P	Right side RSDS data of Red pixel 4,5 bits	
19	BR2N		
20	BR1P	Right side RSDS data of Red pixel 3,2 bits	
21	BR1N		
22	BR0P	Right side RSDS data of Red pixel 1,0 bits	
23	BR0N		
24	GND	Ground	
25	BSTH	Right side start pulse	
26	GND	Ground	
27	VAA	13.5V power supply	
28	VAA	13.5V power supply	
29	VAA	13.5V power supply	
30	V33V	3.3V power supply	
31	V33V	3.3V power supply	
32	VGL	-5.5V power supply	
33	VGL	-5.5V power supply	
34	GND	Ground	
35	TP1	Latch input	
36	POL	Polarity inverting	
37	GND	Ground	
38	FB2P	Left side RSDS data of Blue pixel 4,5 bits	
39	FB2N		
40	FB1P	Left side RSDS data of Blue pixel 3,2 bits	
41	FB1N		
42	FB0P	Left side RSDS data of Blue pixel 1,0 bits	
43	FB0N		
44	FG2P	Left side RSDS data of Green pixel 4,5 bits	
45	FG2N		
46	FG1P	Left side RSDS data of Green pixel 3,2 bits	
47	FG1N		

48	FG0P	Left side RSDS data of Green pixel 1,0 bits	
49	FG0N		
50	GND	Ground	

Note (1) Connector CN1 Part No.:LG-GF058-50S-LSS-AF-P2000 or equivalent.

CN2 Connector Pin Assignment

Pin No.	Symbol	Description	Note
1	GND	Ground	
2	GND	Ground	
3	FCKP	Right side RSDS data clock	
4	FCKN		
5	GND	Ground	
6	FR2P	Left side RSDS data of Red pixel 4,5 bits	
7	FR2N		
8	FR1P	Left side RSDS data of Red pixel 3,2 bits	
9	FR1N		
10	FR0P	Left side RSDS data of Red pixel 1,0 bits	
11	FR0N		
12	GND	Ground	
13	FSTH	Left side start pulse	
14	STV	Gate driver side start pulse	
15	CKV	Gate driver shift clock	
16	OE	Gate driver output enable control	
17	GND	Ground	
18	VGH	23.5V power supply	
19	VGH	23.5V power supply	
20	GND	Ground	

Note (1) Connector CN2 Part No.:LG-GF058-20S-LSS-AF-P2000 or equivalent.

5.2 BACKLIGHT UNIT

Pin	Symbol	Description	Color
1	HV1	High Voltage	Blue or Dark Blue
2	LV	Ground	White

Note (1) Connector Part No.: BHSR-02VS-1 (JST) or equivalent

Note (2) Matching Connector Part No.: SM02-BHSS-1-TB (JST) or equivalent

5.3 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																	
		Red						Green						Blue					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
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	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
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	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
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	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

6. INTERFACE TIMING

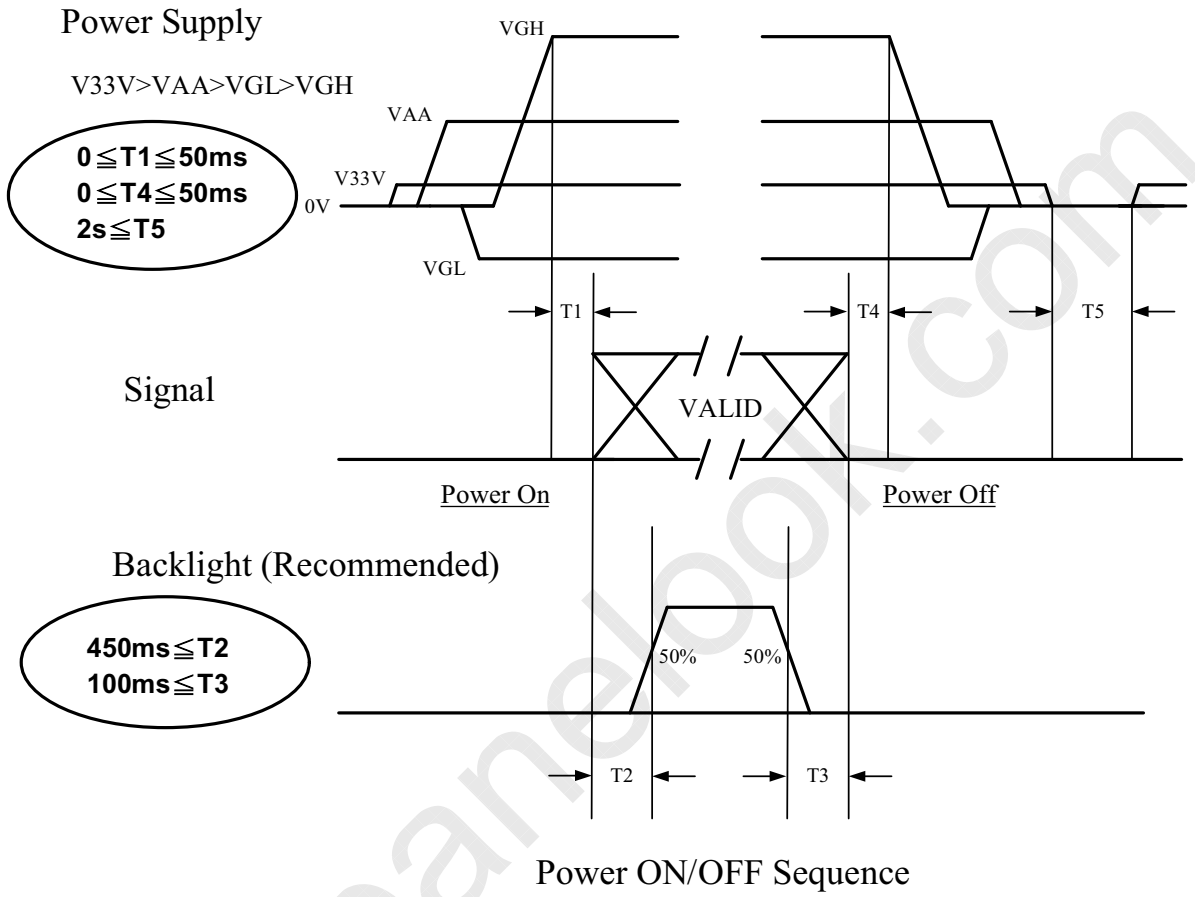
6.1 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
RSDS Receiver Clock	Frequency	1/Tc	-	45	(56)	MHz	
RSDS Receiver Data	Setup Time	Tlvsu	-	-	-	ps	
	Hold Time	Tlvhd	-	-	-	ps	
Vertical Active Display Term	Frame Rate	Fr	-	60	75	Hz	
	Total	Tv	(907)	926	(1050)	Th	Tv=Tvd+Tvb
	Display	Tvd	900	900	900	Th	-
	Blank	Tvb	(7)	26	(105)	Th	-
Horizontal Active Display Term	Total	Th	(750)	800	(960)	Tc	Th=Thd+Thb
	Display	Thd	720	720	720	Tc	-
	Blank	Thb	(30)	80	(240)	Tc	-

6.2 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should be as the diagram below.



Power ON/OFF Sequence

Note (1) The supply voltage of the external system for the module input should be the same as the definition of V33V,VAA,VGL and VGH.

Note (2) Apply the lamp voltage within the LCD operation range. When the backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become abnormal screen.

Note (3) In case of V33V=off level, please keep the level of input signals on the low or keep a high impedance.

Note (4) T5 should be measured after the module has been fully discharged between power off and on period.

Note (5) Interface signal shall not be kept at high impedance when the power is on.

7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	5.0	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Lamp Current	I_L	7.0±0.5	mA
Oscillating Frequency (Inverter)	F_W	52 ± 3	KHz
Frame rate	F_r	60	Hz

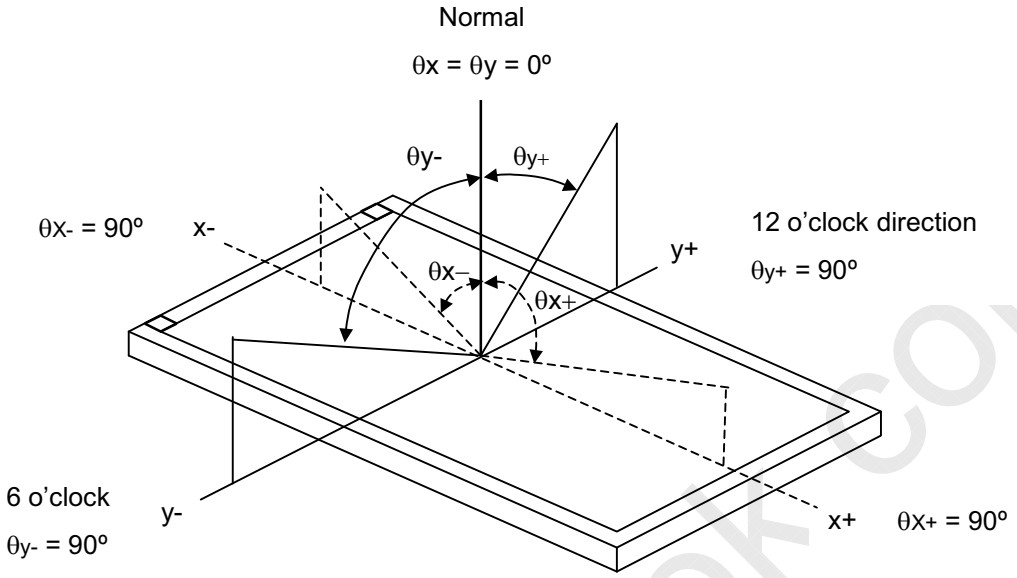
7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (6).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	θ_x=0°, θ_Y =0° Viewing Normal Angle	(800)	(1000)		-	Note(2)
Response time		Gray to gray(Average)			(6.5)	(12)		Note(3)
Center Luminance of White		L_C			(400)		cd/m^2	Note(4)
White Variation		δW				(1.3)	-	Note(7)
Cross Talk		CT				(4)	%	Note(5)
Color Chromaticity	Red	Rx			(0.654)		-	Note(6)
		Ry			(0.333)		-	
	Green	Gx			(0.285)		-	
		Gy			(0.605)		-	
	Blue	Bx			(0.142)		-	
		By			(0.070)		-	
	White	Wx			(0.313)		-	
		Wy			(0.329)		-	
	Color Gamut				(75)		%	NTSC
Viewing Angle	Horizontal	θ_x+	CR≥20	(80)	(88)		Deg.	Note(1)
		θ_x-		(80)	(88)			
	Vertical	θ_Y+		(80)	(88)			
		θ_Y-		(80)	(88)			

Note (1) Definition of Viewing Angle (θx, θy):

Viewing angles are measured by Eldim EZ-Contrast 160R



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

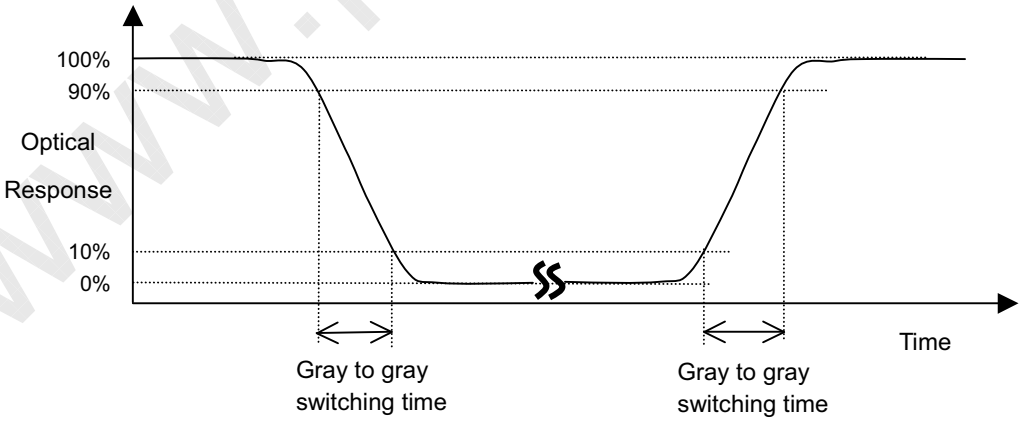
Contrast Ratio (CR) = L255 / L0

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (7).

Note (3)



. The driving signal means the signal of gray level 0, 63, 127, 191, 255.

Gray to gray average time means the average switching time of gray level 0 ,63,127,191,255 to each other.

Note (4) Definition of Luminance of White L_C:

Measure the luminance of gray level 255 at center point.

L_C = L (5), where L (x) is corresponding to the luminance of the point X at the figure in Note (7).

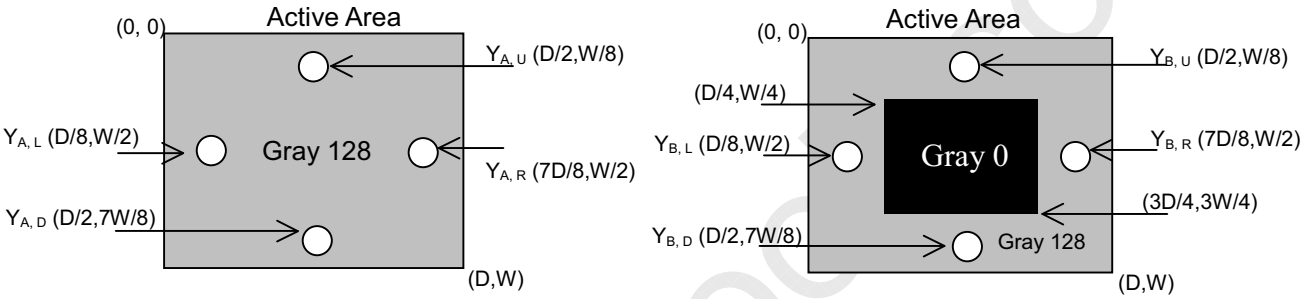
Note (5) Definition of Cross Talk (CT):

$CT = | Y_B - Y_A | / Y_A \times 100$ (%)

Where:

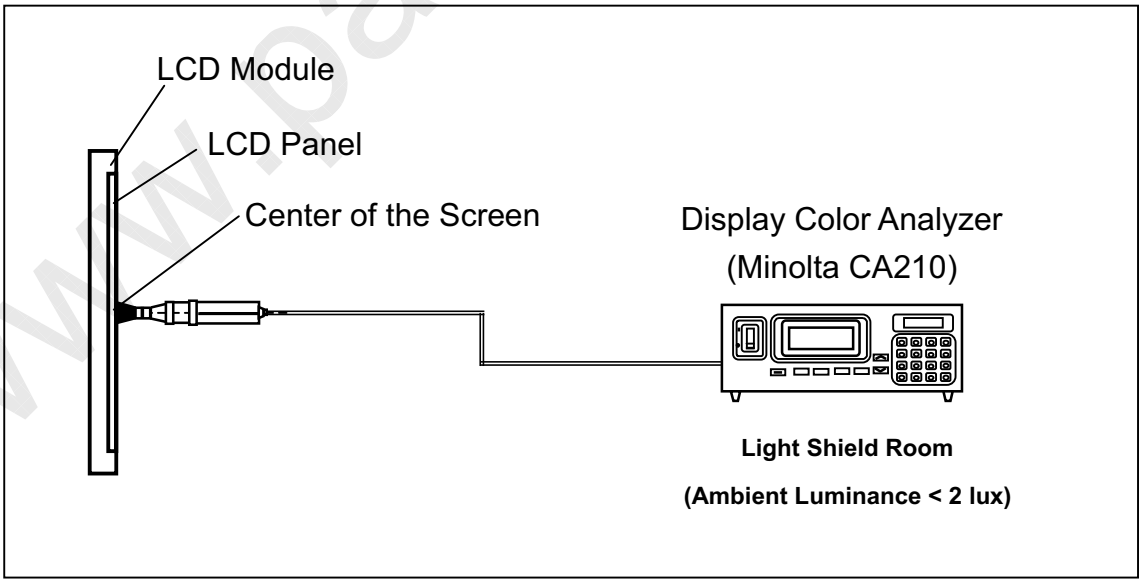
Y_A = Luminance of measured location without gray level 0 pattern (cd/m^2)

Y_B = Luminance of measured location with gray level 0 pattern (cd/m^2)



Note (6) Measurement Setup:

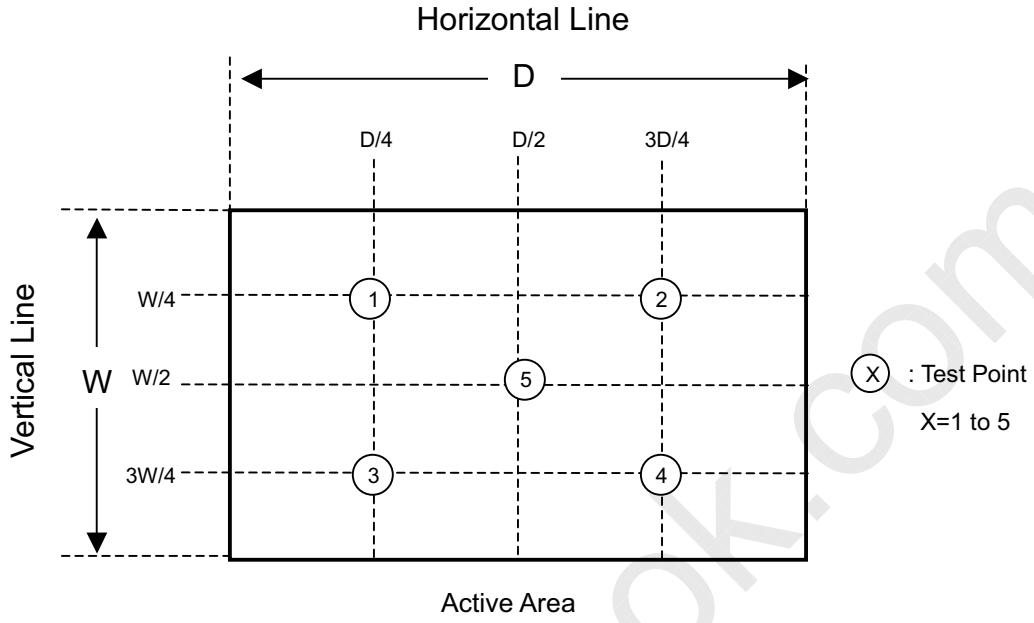
The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 1 hour in a windless room.



Note (7) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

δW = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]



8. PRECAUTIONS

8.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1) Do not apply rough force such as bending or twisting to the module during assembly.

(2) It is recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

(3) Do not apply pressure or impulse to the module to prevent the damage of LCD panel and Backlight.

(4) Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMOS LSI chips.

(5) Do not plug in or pull out the I/F connector while the module is in operation.

(6) Do not disassemble the module.

(7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

(8) Moisture can easily penetrate into LCD module and may cause the damage during operation.

(9) High temperature or humidity may deteriorate the performance of LCD module. Please store LCD modules in the specified storage conditions.

(10) When ambient temperature is lower than 10ºC, the display quality might be reduced. For example, the response time will become slow, and the starting voltage of CCFL will be higher than that of room temperature.

8.2 SAFETY PRECAUTIONS

(1) The startup voltage of a Backlight is approximately 1000 Volts. It may cause an electrical shock while assembling with the inverter. Do not disassemble the module or insert anything into the Backlight unit.

(2) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

(3) After the module's end of life, it is not harmful in case of normal operation and storage.

9. PACKAGING

9.1 PACKING SPECIFICATIONS

(1) 5 LCD TV modules / carton

(2) carton dimensions :596(L) X 330 (W) X 435 (H)

(3) Weight : approximately 22Kg (5 modules per carton)

9.2 PACKING Method

Figures 9-1 and 9-2 are the packing method

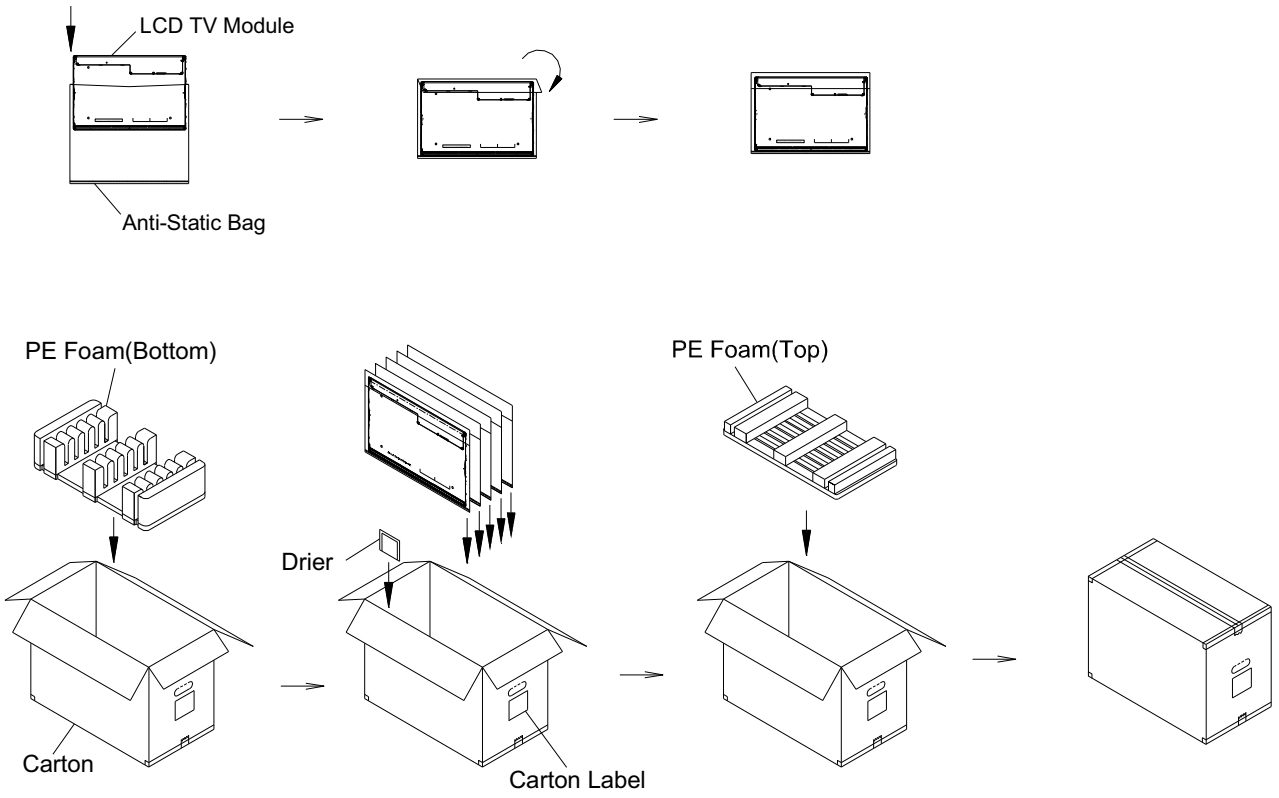


Figure.9-1 packing method

Corner Protector:L1250*50*50mm
L1130*50*50mm
Pallet:L1000*W1200*H140mm
Pallet Stack:L1000*W1200*H1445mm
Gross:412kg

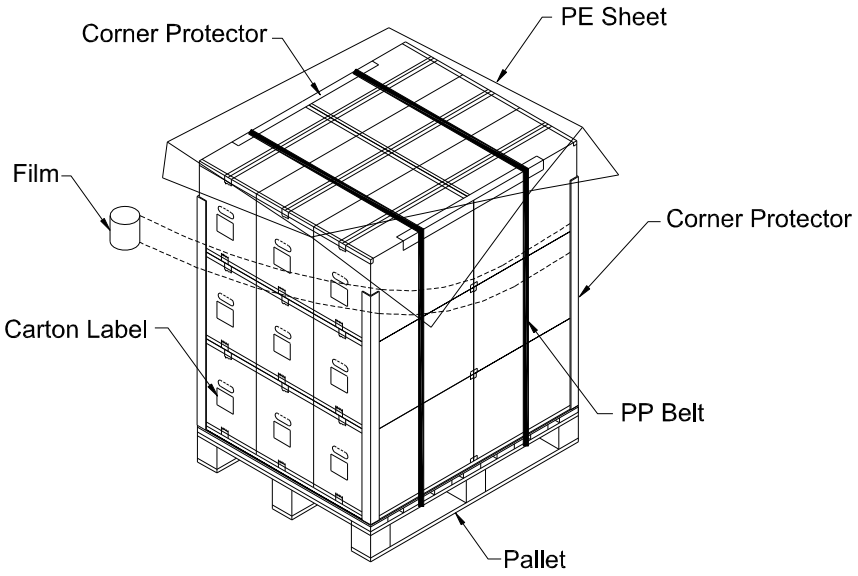


Figure. 9-2 Packing method

10. MECHANICAL CHARACTERISTICS